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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/918,115	07/30/2001	Michael Graetzel	16090-23	2594

7590 03/14/2002

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EXAMINER

HU, SHOUXIANG

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 03/14/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/918,115

Applicant(s)

GRAETZEL ET AL.

Examiner

Shouxiang Hu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on 11 January 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☐ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on 30 July 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 6. 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Specification***

1. The disclosure is objected to because of the following informalities:

The following guidelines illustrate the preferred layout for the specification of a utility application. These guidelines are suggested for the applicant's use.

### **Arrangement of the Specification**

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

- (a) TITLE OF THE INVENTION.
- (b) CROSS-REFERENCE TO RELATED APPLICATIONS.
- (c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT.
- (d) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC (See 37 CFR 1.52(e)(5) and MPEP 608.05. Computer program listings (37 CFR 1.96(c)), "Sequence Listings" (37 CFR 1.821(c)), and tables having more than 50 pages of text are permitted to be submitted on compact discs.) or REFERENCE TO A "MICROFICHE APPENDIX" (See MPEP § 608.05(a). "Microfiche Appendices" were accepted by the Office until March 1, 2001.)
- (e) BACKGROUND OF THE INVENTION.
  - (1) Field of the Invention.
  - (2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.
- (f) BRIEF SUMMARY OF THE INVENTION.
- (g) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).
- (h) DETAILED DESCRIPTION OF THE INVENTION.
- (i) CLAIM OR CLAIMS (commencing on a separate sheet).
- (j) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).
- (k) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825. A "Sequence Listing" is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if

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the required "Sequence Listing" is not submitted as an electronic document on compact disc).

Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim 10 is rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. The subject matter of an amorphous reversibly oxydisable organic compound being a polymer recited in claim 10 is critical or essential to the practice of the invention, but not enabled by the disclosure. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). According to the specification (see page 2, the last two paragraphs), an amorphous reversibly oxydisable organic compound described therein is a non-polymeric compound (such as organic OMeTAD)

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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5. Claims 1-3, 5-8 and 14-15 are rejected under 35 U.S.C. 102(b) as being anticipated by Siebentritt et al. ("Siebentritt"; 14<sup>th</sup> European Photovoltaic Solar Energy Conference, Barcelona, Spain, 30 June-4 July 1997, pages 1823-1826; of Record).

Siebentritt discloses a solid state sensitised photovoltaic cell having a layered p-n heterojunction (Figs. 1 and 2); comprising: an electron conductor (an n-type semiconductor made of TiO<sub>2</sub> (a ceramic (sintered at 400-450 degrees) with nanocrystalline and a large band gap)); a hole conductor (a p-type semiconductor made of inorganic CuI); a sensitizing semiconductor (CdTe or CdS particles (see Table II)) located at an interface between the electron and hole conductors and coated as a film or adsorbed as particles at the surface of the electron conductor; a transparent first electrode (SnO<sub>2</sub>:F); and a second electrode ("metal").

### ***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 4, 13, 17 and 18 are rejected under 35 U.S.C. 103(a) as being obvious over Siebentritt et al. ("Siebentritt"; 14<sup>th</sup> European Photovoltaic Solar Energy Conference, Barcelona, Spain, 30 June-4 July 1997, pages 1823-1826; of Record) in view of Vogel et al. ("Vogel"; Chemical Physics Letters, V174, N3&4, 9 November 1990, pages 241-246; of record).

The disclosure of Siebentritt is discussed as applied to claims 1-3, 5-8 and 14-15 above.

Although Siebentritt does not expressly disclose that the particles of the sensitizing semiconductor can be in form of quantum-dots, Vogel teaches that a quantum-dot-sized sensitizing semiconductor of CdS is desirable for achieving high photocurrent efficiency (see the abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the quantum-dot-sized sensitizing semiconductor of Vogel into the p-n heterojunction in the solid state sensitized photovoltaic cell of Siebentritt, so that a photovoltaic cell with high photocurrent efficiency would be achieved.

8. Claims 9-12, insofar as being in compliance with 35 U.S.C. 112, are rejected under 35 U.S.C. 103(a) as being obvious over Siebentritt et al. ("Siebentritt"; 14<sup>th</sup> European Photovoltaic Solar Energy Conference, Barcelona, Spain, 30 June-4 July 1997, pages 1823-1826; of Record) in view of Bach et al ("Bach"; Nature, V395, 8 October 1998, pages 583,585; of record).

The disclosure of Siebentritt is discussed as applied to claims 1-3, 5-8 and 14-15 above.

Although Siebentritt does not expressly disclose that the hole conductor can also be made of organic OMeTAD, Bach teaches that organic OMeTAD can be a preferred a hole conductor for achieving high photon-to-electron efficiencies (see the abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the organic OMeTAD hole conductor of Bach into the p-n heterojunction in the solid state sensitized photovoltaic cell of Siebentritt, so that a photovoltaic cell with high photon-to-electron efficiencies would be achieved.

9. Claim 16 are rejected under 35 U.S.C. 103(a) as being obvious over Siebentritt et al. ("Siebentritt"; 14<sup>th</sup> European Photovoltaic Solar Energy Conference, Barcelona, Spain, 30 June-4 July 1997, pages 1823-1826; of Record) in view of Kay et al. ("Kay"; 5,525,440).

The disclosure of Siebentritt is discussed as applied to claims 1-3, 5-8 and 14-15 above.

Although Siebentritt does not expressly disclose that the cell can further comprise a dense semiconductor layer between the first electrode and the heterojunction, Kay teaches to form a photo cell (Fig. 1) comprising a dense semiconductor layer (3; a non-porous TiO<sub>2</sub>) between a first electrode (2A) and the cell junction portion (4-6) for providing a desired diffusion barrier function.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the dense semiconductor layer of Kay into the solid state sensitized photovoltaic cell of Siebentritt, so that a photovoltaic cell with a desired diffusion barrier would be obtained.

***Conclusion***

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. References B-D are cited as being related to a photo cell structure.

11. Papers related to this application may be submitted to Technology center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located in Crystal Plaza 4, room 4-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Group 2811 Fax Center number is (703) 308-7722 or 308-7724. The Group 2811 Fax Center is to be used only for papers related to Group 2811 applications.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ***Shouxiang Hu*** whose telephone number is **(703) 306-5729**. The examiner can normally be reached on Monday through Thursday from 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, ***Tom Thomas***, can be reached on **(703) 308-2772**. The appropriate fax phone number for the organization where this application or proceeding is assigned is **(703) 308-7724**.



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Any inquiry of a general nature or relating to the status of this application should be directed to the **Technology Center Receptionists** whose telephone number is **(703) 308-0956**.

A handwritten signature in black ink, appearing to read 'Shouxiang Hu', with a stylized, cursive script.

Shouxiang Hu

March 9, 2002